Claims

1. Method for operating an automatic device (2) by means of an electronic directing system, said system comprising at least one first electrical cable (1,4,5,6) connected to at least one first signal generator (3,7,8) and at least one sensing system (11,12,13) arranged on said device (2), said sensing system (11,12,13) detecting at least one magnetic field being transmitted via said cable (1,4,5,6) and propagating through the air, the sensing system transmitting a processed signal to at least one driving means which contributes to the movements of said device in relation to a surface,
characterized in that said first signal generator (3,7,8) transmits a current through said first cable (1,4,5,6), said current during a part of time is in a state of rest were it is substantially constant, said state of rest periodically being interrupted by at least one first characteristic current pulse (20).

2. Method according to any of the preceding claims **characterized in** that said sensing system (11,12,13) adapts the time intervals (28,29) within which the system (11,12,13) detects magnetic fields based on the properties of said first current pulse (20).

3. Method according to claim 2 **characterized in** that said adaptation refers to the synchronization of frequency at which said sensing system (11,12,13) operates, which is being made by said system (11,12,13) based on said first current pulse (20).

4. Method according to any of the claims 2 – 3 **characterized in** that said adaptation refers to the synchronization of said time intervals (28,29), which is being made by said sensing system (11,12,13), is based on the periodicity, time occurrence and/or the durability of said first current pulse (20).

5. Method according to any of the claims 2 – 4 **characterized in** that said time intervals (28,29) are being adapted so that the sensing system (11,12,13) is able to detect the presence of current pulses (20,22,24,26) transmitted from said directing system, said sensing system (11,12,13) during the await of the next pulse (20,22,24,26) to appear disregards pulses occurring outside said time intervals (28,29).

6. Method according to any of the preceding claims **characterized in** that the current in each of said electrical cables (1,4,5,6) is being transmitted by one of said signal generators (3,7,8), said generator (3,7,8) synchronizing each current pulse (20,22,24,26) it transmits with other current pulses (20,22,24,26) in the search system, in that no current pulses (20,22,24,26) in the search system will occur at the same point of time within the same period (21).

7. Method according to any of the preceding claims **characterized in** that the current in each of said electrical cables (1,4,5,6) is being transmitted by one of said signal generators (3,7,8), said generator (3,7,8) synchronizing each current pulse (20,22,24,26) it transmits with other current pulses (20,22,24,26) in the search system, in that the time distance between each current pulse (20,22,24,26) occurring in said search system is large enough so that signals generated in the sensing system (11,12,13) that originate from a current pulse (20,22,24,26) has partly decayed before generated signals that originate from another current pulse (20,22,24,26) occurs.

8. Method according to any of the preceding claims **characterized in** said current in more than one electrical cable (1,4,5,6) is transmitted from the same signal generator (3).

9. Method according to any of the preceding claims **characterized in** that said current has the same period (21) irrespective of the electrical cable (1,4,5,6) through which it is transmitted.

10. Method according to claim 9 **characterized in** that the period (21) for the search system is selected by the user of the search system.

11. Method according to any of the preceding claims **characterized in** that every current pulse (22,24,26) has a by the search system defined time of occurrence adapted to said first current pulse (20).

12. Method according to any of the preceding claims **characterized in** that a transmitted current pulse (20,22,24,26) in each electrical cable (1,4,5,6) contains a course of events in time where the pulse is positive and negative in relation to said state of rest for the current.

13. Method according to any of the preceding claims **characterized in** that said first current pulse (20) has a pulse characteristic which differs from the characteristic of other current pulses (22,24,26) in the search system.

14. Method according to any of the preceding claims **characterized in** that said sensing unit (11,12,13) detects the magnetic field (20,22,24,26) transmitted from at least one of said electrical cables (1,4,5,6) in the whole area in which the device is intended to operate.

15. Method according to any of the preceding claims **characterized in** that at least one of said electrical cables (6) is connected directly to one of said other electrical cables (1).

16. Method according to any of the preceding claims **characterized in** that the sensing unit (11,12,13) only detects the magnetic field transmitted from one of said electrical cables (1,4,5,6) in a part of the area in which the device is intended to operate.

17. Method according to any of the preceding claims **characterized in** that at least one signal generator (3,7,8) transmits information to the sensing system (11,12,13) through a selective change of the properties of an information current pulse (22,26) from period to period, said information current pulse (22,26) occurring in an electrical cable at a certain point of time in relation to the first current pulse (20).

18. Method according to claim 17 **characterized in** that said selective change of the properties for the information current pulse (22,26) constitutes in a choppy current direction.

19. Method according to claim 17 **characterized in** that said selective change of the properties for the information current pulse (22,26) constitutes in selectively inhibited current pulses.

20. Method according to claim 17 **characterized in** that said selective change of the properties for the information current pulse (22,26) constitutes in current pulses with selectively different pulse width.

21. Method according to any of the claims 17 – 20 **characterized in** that different operations are activated at the device (2) based on said information, said operations for instance being a regulation of the movements of said device (2) across the surface in relation to an electrical cable (1,4,5,6).

22. Method according to any of the preceding claims **characterized in** that the sensing system (11,12,13) only detects current pulses (20,22,24,26) if they constitutes in magnetic field pulses with one essential field direction.

23. Method according to any of the preceding claims **characterized in** that the sensing system (11,12,13) detects the positive and negative flank of a current pulse (20,22,24,26), whereby the time distance between these two flanks settles the processing said system makes based on the detected flanks.

24. Method according to claim 23 **characterized in** that the sensing system (11,12,13) detects said flanks by detecting occurred voltage pulses.

25. Method according to any of the preceding claims **characterized in** that the sensing system (11,12,13) with knowledge of said occurred voltage pulses (50/50') detects on which side of a cable (1,4,5,6) at least a part of the device (2) is being positioned.

26. Method according to claim 25 **characterized in** that said detection refers the fact that the sensing unit (11,12,13) detects the magnetic field (50/50') which is being generated from at least one current pulse (45) and based on the properties (50/50') of said magnetic field detects on which side of a cable (1,4,5,6) at least a part of the device (2) is being positioned.

27. Method according to any of the claims 25 - 26 **characterized in** that said detection refers the fact that the sensing unit (11,12,13) detects the magnetic field (50/50') which is being generated from at least one current pulse (45) and based on the relation between at least one via said magnetic field (50/50') detected current pulse (45) and at least one via said magnetic field (50/50') detected state of rest detects on which side of a cable (1,4,5,6) at least a part of the device (2) is being positioned.

28. Method according to any of the claims 25 - 27 **characterized in** that the sensing unit (11,12,13) detects on which side of a cable (1,4,5,6) at least a part of the device (2) is positioned by generating an interpretation signal (T) based on the detected magnetic field, the characteristics of said interpretation signal being dependent on which side of said cable at least a part of the device (2) is being positioned.

29. Method according to claim 28 **characterized in** that the sensing system (11,12,13) with knowledge of the characteristics of the interpretation signal (T) operates the automatic device (2) in relation to a cable (1,4,5,6).

30. Method according to claim 29 **characterized in** that said characteristics refers to a pulse ratio corresponding to the time division between those occasions during which a characteristic signal pulse occurs and those occasions during which no such signal pulse occurs.

31. Method according to claim 30 **characterized in** that said pulse ratio has an asymmetric characteristic.

32. Method according to any of the claims 29 - 32 **characterized in** that the sensing system (11,12,13) based on the detection on which side of a cable (1,4,5,6) at least a part of the device (2) is being positioned operates the automatic device (2) in relation to a cable (1,4,5,6).

33. Method according to any of the claims 29 - 32 **characterized in** that the operation refers to the fact that the device (2) is being manoeuvred to a certain side of a cable (1,4,5,6).

34. Method according to any of the preceding claims **characterized in** that said current pulse and/or voltage pulse and/or signal pulse refers to a square wave.

35. Method according to any of the preceding claims **characterized in** that pulse ratio, which corresponds to the time division between those occasions during which a characteristic current pulse occurs and those occasions during which no characteristic current pulse occurs, is asymmetric.

36. Method according to any of the preceding claims **characterized in** that the sensing unit (11,12,13) through detecting information from current pulses (20,22,24,26) or through detecting information from the user, activates an operation which uses the knowledge said sensing system has about the electrical cable (1,4,5,6) collected by detecting additional information sent by the electrical cable (1,4,5,6).

37. Method according to claim 36 **characterized in** that said activation of an operation means that the device when approaching an electrical cable (1,4,5,6) substantially follows (31,32) said cable (1,4,5,6) in one of its extension directions.

38. Method according to any of the claims 36 – 37 **characterized in** that said activation of an operation means that the device when being within an area surrounded by an electrical cable (1,4,5,6) and approaches said cable (1,4,5,6) changes direction and moves (30) inside said area away from said cable (1,4,5,6).

39. Method according to any of the claims 36 – 38 **characterized in** that said activation of an operation means that a user via a control device can control the movements and/or treatment that the device is performing.

40. Method according to any of the preceding claims **characterized in** that the sensing system (11,12,13) transmits information.

41. Method according to claim 40 **characterized in** that said transmitted information is being sent in the time interval between two occurring current pulses (20,22,24,26).

42. Electronic directing system operating an automatic device (2), said system comprising at least one first electrical cable (1,4,5,6) connected to at least one first signal generator (3,7,8) and at least one sensing system (11,12,13) arranged on said device, said sensing system (11,12,13) detecting at least one magnetic field being transmitted via said cable (1,4,5,6) and propagating through the air, the sensing system transmitting a processed signal to at least one driving means which contributes to the movements of said device in relation to a surface,

characterized in

that said system comprises means by which said first signal generator (3,7,8) transmits a current through said first cable (1,4,5,6), said current during a part of time being in a state of rest were it is substantially constant, said state periodically being interrupted by at least one first characteristic current pulse (20).

43. Electronic directing system according to claim 42 **characterized in** that said current has the same period (21) irrespective of the electrical cable (1,4,5,6) through which it is transmitted.

44. Electronic search system according to any of the claims 42 – 43 **characterized in** that every current pulse (22,24,26) has a by the search system defined time occurrence adapted to said first current pulse (20).

45. Electronic directing system according to any of the claims 42 – 44 **characterized in** that a transmitted current pulse (20,22,24,26) in each electrical cable (1,4,5,6) contains a course of events in time where the pulse is positive and negative in relation to said state of rest for the current.

46. Electronic directing system according to any of the claims 42 - 45 **characterized in** that said first current pulse (20) has a pulse width which differs from the pulse width of other current pulses (22,24,26) in the search system.

47. Electronic directing system according to any of the claims 42 – 46 **characterized in** that said sensing unit (11,12,13) detects the magnetic field (20,22,24,26) transmitted

from at least one of said electrical cables (1,4,5,6) in the whole area in which the device is intended to operate.

48. Electronic search system according to any of the claims 42 – 47 **characterized in** that at least one of said electrical cables (6) is connected directly to one of said other electrical cables (1).

49. Electronic search system according to any of the claims 42 – 48 **characterized in** that at least one of the electrical cables (1,4,5,6) is arranged above, within or below the surface which the device (2) is intended to move in relation to, said cable (1,4,5,6) thereby separates an inner area of said surface being surrounded by the cable (1,4,5,6) from an outside area outside said cable (1,4,5,6).

50. Electronic device according to any of the claims 42 - 49 **characterized in** that the sensing unit (11,12,13) only detects the magnetic field transmitted from one of said electrical cables (1,4,5,6) in a part of the area in which the device (2) is intended to operate.

51. Electronic device according to any of the preceding claims **characterized in** that an automatic device (2) refers to a treating robot which comprises a treatment system for treating said surface.

52. Electronic device according to claim 51 **characterized in** that the treatment system is operated based on information received and/or stored for treatment operations by the sensing system (11,12,13).

53. Electronic device according to any of the claims 51 – 52 **characterized in** that said device relates to an automatic lawnmower, whereby said treatment system constitutes in knives cutting the plants growing on said surface.

54. Electronic device according to any of the claims 51 – 52 **characterized in** that said device relates to an automatic vacuum cleaner, whereby said treatment system relates to parts which a normal automatic vacuum cleaner is equipped with for cleaning said surface, said parts for instance being a brush roller and a suction device.

55. Electronic device according to any of the claims 51 – 52 **characterized in** that said device relates to an automatic cleaning robot, whereby said treatment system relates to parts which a normal cleaning robot is equipped with for cleaning a surface, such as tools for wet cleaning.